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Bluetooth Controlled Data Logger Robot for Soil Testing.

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Abstract: *Land based drone technology has considerable potential for usage in different areas of agriculture. Here a novel robotic soil sampling device is being introduced. Unmanned mobile technology implementation for soil sampling automation is significantly increasing the efficiency of the process. This automated and remotely controlled technology is enabling more frequent sample collection than traditional human operated manual methods. In this publication universal mobile robotic platform is adapted and modified to collect and store soil samples from fields and measure soil parameters simultaneously. The platform navigates and operates autonomously with dedicated software and remote server connection. Mechanical design of the soil sampling device and control software is introduced and discussed.*

Keywords: Data Logger Robot

I. INTRODUCTION

This project mainly focuses on Leading for more accurate fertilizer Land based drone technology has considerable potential for usage in different areas of agriculture. Here a novel robotic soil sampling device is being introduced. Unmanned mobile technology implementation for soil sampling automation is significantly increasing the efficiency of the process. This automated and remotely controlled technology is enabling more frequent sample collection than traditional human operated manual methods. In this publication universal mobile robotic platform is adapted and modified to collect and store soil samples from fields and measure soil parameters simultaneously. The platform navigates and operates autonomously with dedicated software and remote server connection. Mechanical design of the soil sampling device and control software is introduced and discussed.

II. LITERATURE SURVEY

The paper number [4] presents a streamlined approach to future Precision Autonomous Farming (PAF). It focuses on the preferred specification of the farming systems including the farming system layout, sensing systems and actuation units such as tractor-implement combinations. The authors propose the development of the Precision Farming Data Set (PFDS) which is formed off-line before the commencement of the crop cultivation and discusses its use in accomplishing reliable, cost effective and efficient farming systems. The work currently is in progress towards the development of autonomous farming vehicles and the results obtained through detailed mathematical analysis of example actuation units. The reference paper [5] addresses the advanced weed control system which improves agriculture processes like weed control, based on robotic platform. They have developed a robotic vehicle having four wheels and steered by dc motor. The machine controls the weed in the firm by considering particular rows per column at fixed distance depending on crop. The obstacle detection problem has also been considered, sensed by sensors .the whole algorithm, calculation, processing, monitoring was designed with motors & sensors paper [5] addresses the advanced weed control system which improves agriculture processes like weed control, based on robotic platform. They have developed a robotic vehicle having four wheels and steered by dc motor. The machine controls the weed in the firm by considering particular rows per column at fixed distance depending on crop. The obstacle detection problem has also been considered, sensed by

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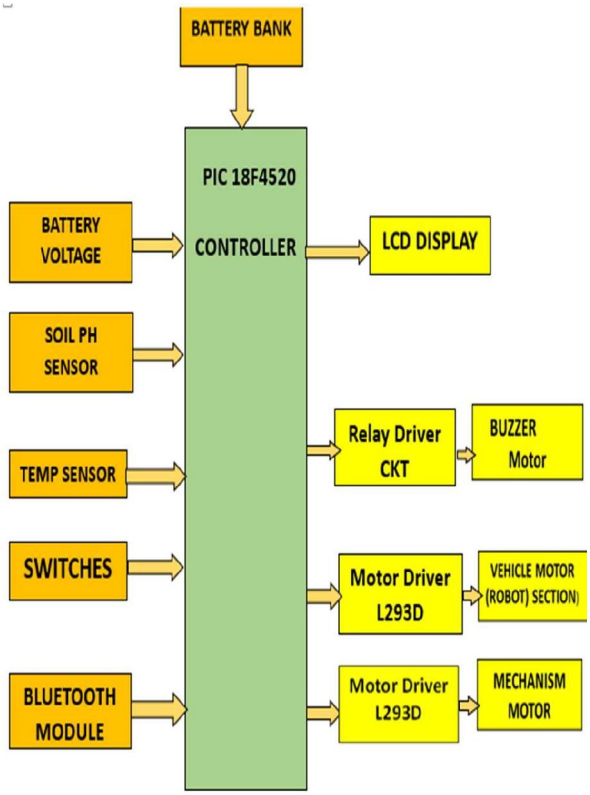
III. BLOCK DIAGRAM



3.1 Test Method

To observe the performance of the robotic platform equipped with soil sampling system and controlled by corresponding software, the was tested in real-conditions.

The performance test was carried out in comparison with traditional method with human operator with atv and manual probe.

Operation speed as performance indicator is measured With Sample Count Per Time Unit Which Depends On Sample Taking Time And Driving Time Between Grid Points.

Sampling quality is determined how good representation Of Soil Mean Composition The Collected Samples Are And Is Solved By Control Software During Sampling Path Generation.

3.2 Soil Sampling System

As secondary actions use hydraulic cylinders, screw mechanism on probe maintains constant process speed and enables to integrate penetrometer drive with the probe. To measure the sampler mechanism position, the motor and screw mechanisms were fitted with rotary encoders and limit position detection with inductive sensors.

As only fraction of soil amount in core is taken to container due to volume restriction, container end position is adjusted under the probe while the cleaner rod pushes collected core out of probe for automating sample handling and storage, other solutions use often robotic manipulator arm.

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PIC18F4520 Microcontroller

Microcontroller (PIC18F4520)

PIC18F4520 is a low-cost, low-power, high- speed 8-bit, fully-static Microcontroller unit that has 40 pins out of which 36 pins can be used as I/O pins. It has Power- on-Reset (POR) as well as the Extended Watchdog Timer (WDT) circuitry, which can be programmed for 4ms to 131s It is an 8-bit enhanced flash PIC microcontroller that comes with nona Watt technology and is based on RISC architecture. Many electronic applications house this controller and cover wide areas ranging from home appliances, industrial automation, security system and end-user products. This microcontroller has made a renowned place in the market and becomes a major concern for university students for designing their projects, setting them free from the use of a plethora of components for a specific purpose, as this controller comes with inbuilt peripheral with the ability to perform multiple functions on a single chip.

PH Sensor

With Three-Way Soil Meter For Moisture, Light Intensity and pH Testing Meter, you can easily check on the condition of your plants. The moisture meter will quickly tell whether your plants are doing well. Firstly, let you know that dry and needs water or wet and could use a day to dry out, you will never over/under water your plants again. Secondly, it helps you to control pH level in soil, acidic or alkaline is suitable for your plants. Thirdly, testing whether plants getting adequate sunlight. Above all, equipped with this meter, you can give the best care to your plants.

Bluetooth Module HC-05

The IOT enabled projects require two way communication between the microcontroller and various sensors. There are various methods you can do that, Wired Communication, Wi-Fi, Bluetooth are some among them. The **HC-05 Bluetooth Module** adds wireless communication to your project to communicate via Bluetooth to any Bluetooth enabled Laptop or Mobile Device. The module communicates at 9600 baud rate via USART protocol. It can be used in applications like communication between two microcontrollers, data logging, wireless robots, wireless sensors data acquisition and home automation.

16x2 LCD Display

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over seven segments and other multi segment LEDs. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even custom characters (unlike in seven segments). Animations and so on.

A 16x2 LCD means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data

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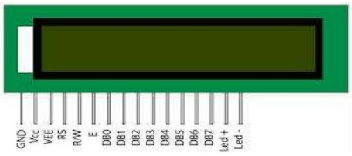

Buzzer

There are many ways to communicate between the user and a product. One of the best ways is audio communication using a buzzer IC. So during the design process, understanding some technologies with configurations is very helpful. So, this article discusses an overview of an audio signaling device like a beeper or a buzzer and its working with applications

Motor Driver L293D

L293D contains two inbuilt H-bridge driver circuits. In its common mode of operation, two DC motors can be driven simultaneously, both in forward and reverse direction. The motor operations of two motors can be controlled by input logic at pins 2 & 7 and 10 & 15. Input logic 00 or 11 will stop the corresponding motor. Logic 01 and 10 will rotate it in clockwise and anticlockwise directions, respectively. Enable pins 1 and 9 (corresponding to the two motors) must be high for motors to start operating. When an enable input is high, the associated driver gets enabled. As a result, the outputs become active and work in phase with their inputs. Similarly, when the enable input is low, that driver is disabled, and their outputs are off and in the high-impedance state. They are designed to drive inductive loads such as relays, solenoids, dc and bipolar stepping motors, as well as their high- current/high-voltage loads in positive-supply applications.

IV. WORKING & OPERATION

Initially, both motors are stopped and the robot is also at rest. To move the robot in any direction, we have to give commands from the smartphone through the Bluetooth-based Android application. To do this, we have to open (start) the Bluetooth Android application in the smartphone and then search for the HC05 Bluetooth module. Once the smartphone detects the HC05 module, it's required to pair the module with the application so that it can send commands from the smartphone via Bluetooth to the HC05 module (note: it's required to enter the passkey "1234" the first time to pair with the HC05 module). Now, we can send commands to the robot to move forward, reverse, left, or right via the smartphone through the application. When any of the above commands are sent (by sending direct character or pressing the button in the application), it's received by the HC05 module. The module further gives this command to Arduino, serially, through the Tx-Rx pins. Arduino receives this command and compares it with the set commands. If it finds a match, it will rotate the left and right motors accordingly to move the robot in any of the appropriate four directions. Once the robot starts its motion, it will continuously move until we send the command 'S' to stop.

When the robot stops, it will start reading the sensor values from the DHT11, soil moisture, and LDR. It will read the analog voltage output from the soil moisture sensor and the LDR, and convert it in a range of 0 – 100%. It will also read the digital values of the temperature and humidity from the DHT11 sensor. Then it transmits all four values of soil moisture, light intensity, temperature, and humidity to the smartphone via the Bluetooth module, it

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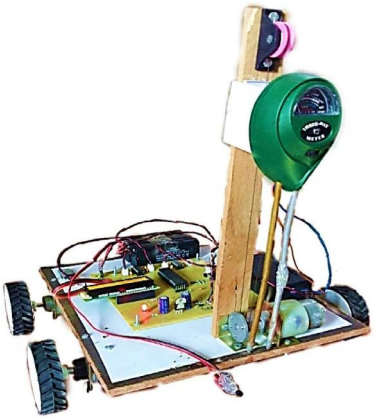
will continuously transmit these four values after every two seconds until it is stopped.
When given the command to start moving again, it will stop transmitting the values.
The operator can take this robot to the required place and measure these four conditions. He or she will get the readings on his or her smartphone while moving the robot with the touch of a finger. It should be easy to program the ambient conditions of temperature, humidity, soil moisture, and light intensity in the nearby area.

V. SOFTWARE SPECIFICATIONS

MPLABIDE8.91

VI. RESULT



6.1 Scope of Project

Since the project is a prototype that was developed under some limitations and in short time, there are some tasks that should be done in the future and would develop the system to a more mature state. The most important and useful job that has to be done is the real field testing for extended time and with several sensor platforms and sensors deployed in fields. This will provide feedback that could be meaningful for the further development of the system and would include the user's insights and real needs. Flood control Water usage audit of house hold, industrial sector and agriculture.

VII. ACKNOWLEDGMENT

"Perfect and precious guidance, hard work, dedication and full encouragement are needed to complete a project successfully in the life of every student illumination of project work is like engraving a diamond
We take this opportunity on the successful completion of our project so thank all the staff for their valuable guidance, for devoting their precious time, sharing their knowledge and their co-operation throughout all course of development our project and the academic year of education.
We a deep guidance to our project **Mrs. Kanawade M.V (Project Guide)** whose valuable guidance, which has been a key factor in the successful completion of our project. Also we a deep guidance to our project **Prof. Borhade G.L (project Co-ordinator)** has been a key factor in the successful completion of our project
A remarkable and unspeakable person in our life **Prof Kulkarni B. L HOD E&TC** Department) whom we have a gratitude and respected for developing entrepreneurship qualities and sharing his knowledge and lifetime experience to make our future glorious Also our special thanks to **Prof. V. B. DHUMAL (Principal)** & management staff whose assistance is also an important part in completion of our project
Lastly we take opportunity to thank one and all who directly or indirectly have helped using the successful completion of our project.

VIII. CONCLUSION

A solution was proposed for automating the soil sampling process and mounted to mid-size mobile robot

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platform. Using cloud-based control software, this hydraulic electro-mechanical device was tested for speed and efficiency. During testing, the current system was found out to be 50% faster of a traditional method. It does not require human intervention during the process, only the process planning, robot transportation and handling of collected samples is carried out by operator. As the purpose of current project is sample collecting method and technical solution research, the system durability and efficiency can be improved further during the planned product development: As hydraulic actuators offer good speed and force capability, they should be kept on future development. Due to navigation system great impact on overall efficiency, process could also be improved much with validation of different path calculation algorithms. As the vehicle is stopped for probing, several soil parameters can be measured simultaneously with additional instruments: humidity, density, temperature etc

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